gonal eye-piece, for the purpose of reaching small zenith stars up to the seventh magnitude, as agreed upon for correcting any error in longitude between Hobart Town and Melbourne. Mr. Ellery selected forty-nine such stars, which were to be used at both places, reversing the instruments at each observation so as to eliminate any errors. With these means, and for this purpose, I find it difficult, and only under very favourable circumstances possible, to reach stars of the seventh magnitude.

My reason for not attempting measures with the Equatoreal is, in consequence of a long-experienced difficulty arising from the want of clock movement, which I consider indispensable for the accurate measurement of distances. I preferred, therefore, an eye-and-hand drawing, when the object has been in a convenient position, approximately 75° from the meridian towards the east, and 35° from the zenith.

The alterations which have taken place in the Nebula since 1868 will at once be seen on an inspection of the drawings, and by comparing them with each other. In the Cape Monograph, the dark space is an inclosure. In 1863 it had two openings, one at each end. In 1868 there were four openings; and now, in 1870, there are five which expose a number of isolated and distinct stars, rendering it difficult, but from position, to know which is the star *η Argûs*. There is attendant on these changes an increase of light which is notable up to the present time. During the last three full Moons (December, January, and February), when both the object and the Moon are approaching the meridian, the light around *η Argûs* is distinctly seen when all other Nebulæ are shut out. This increase of light may arise from one of two causes; either the Nebula has become concreted into isolated stars, or in its dispersion it has laid bare distinct stars which give out more light. The same physical forces that have worked out our own solar system are still at work in the stellar universe. Creation is still going on, and why not?

Private Observatory, Hobart Town,
Tasmania, Feb. 15th, 1870.

P.S.—I may mention, in conclusion, that I have on several fine nights tried one of Mr. Huggins' hand spectrum telescopes, as described in the *Proceedings of the Royal Society*, vol. xvi. No. 98, without being able to detect any appearance of bright lines in the Nebula of *η Argûs*, such as those seen in that of *Orion*.

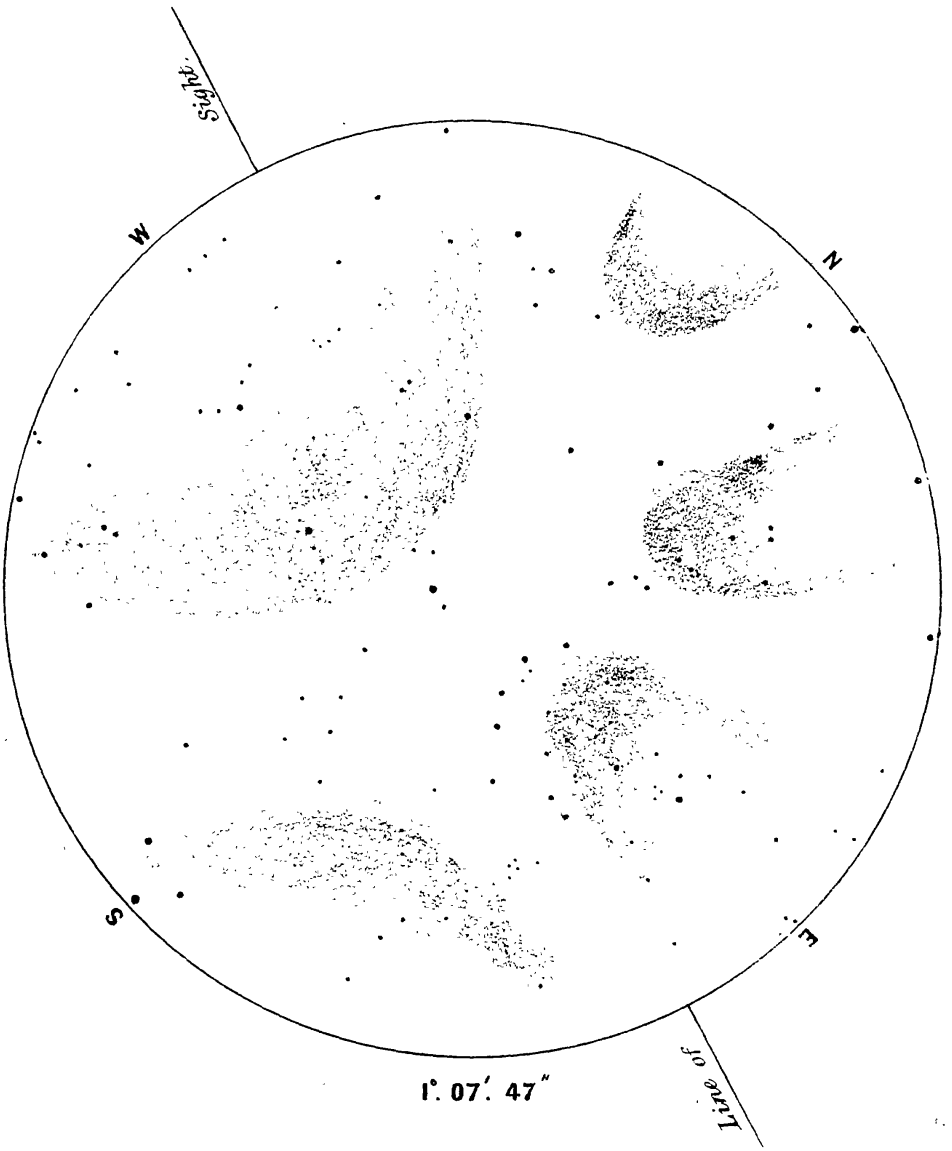
Remarks on Mr. Abbott's foregoing Paper on η Argûs.

By Sir J. F. W. Herschel, Bart.

Pursuant to the request of the Council of the Royal Astronomical Society, I have carefully perused Mr. Abbott's communication on *η Argûs*, dated Feb. 15, 1870, and examined the dia-

η ARGUS AS SITUATED TO THE DARK SPACE,
VARIABILITY OF THE SURROUNDING NEBULÆ,
WITH THE MAGNITUDE AND POSITION OF ACCOMPANING STARS.
UP TO THE PRESENT TIME.

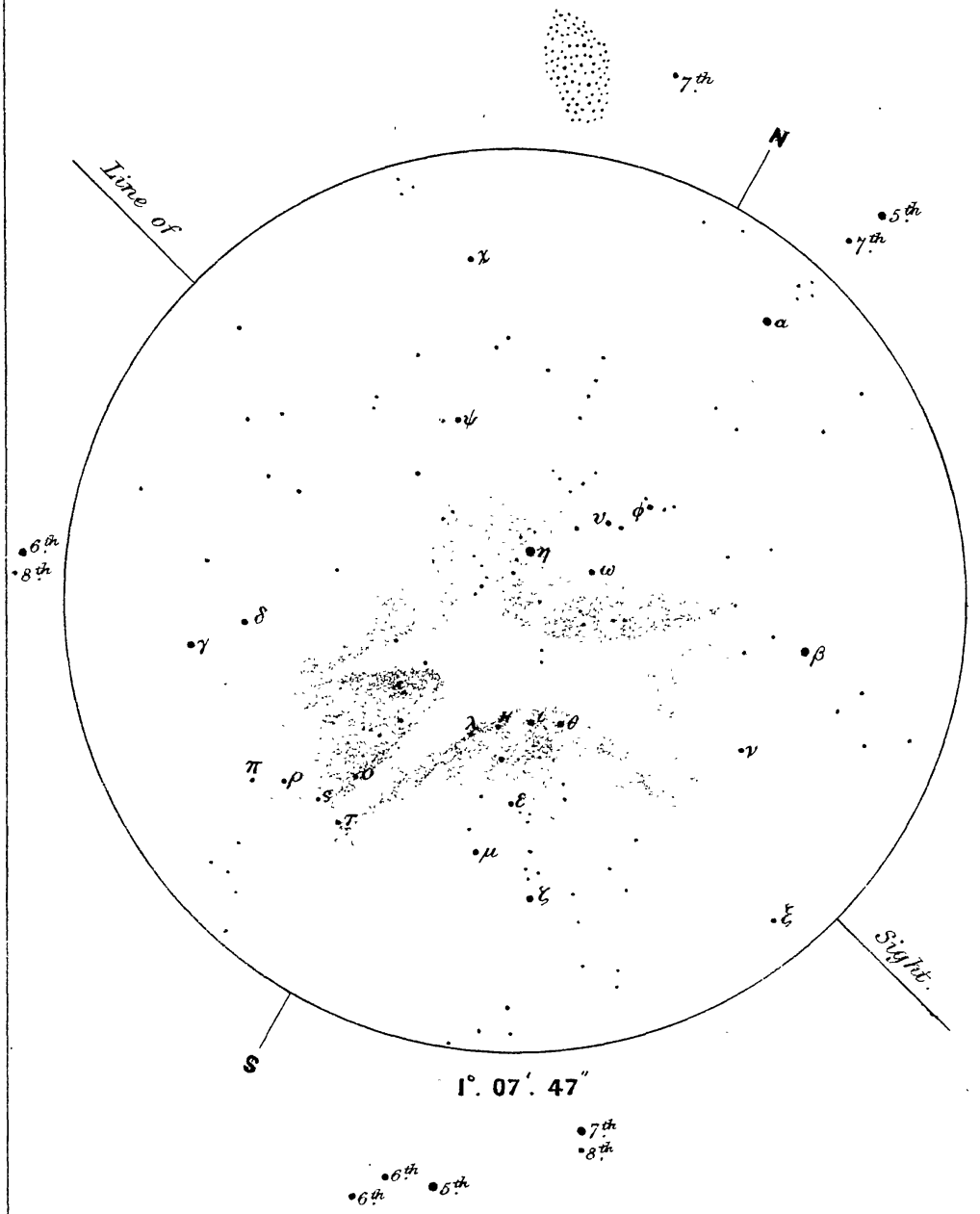
1870.



TAKEN JANUARY 28TH 1870.

W. Metcalfe & Sons. Litho: Cambridge.

APPROXIMATE DISTANCES AND MAGNITUDES OF THE PRINCIPAL STARS AND NEBULÆ SURROUNDING η ARGUS. TAKEN AT HOBART TOWN, FEBRUARY 1871.



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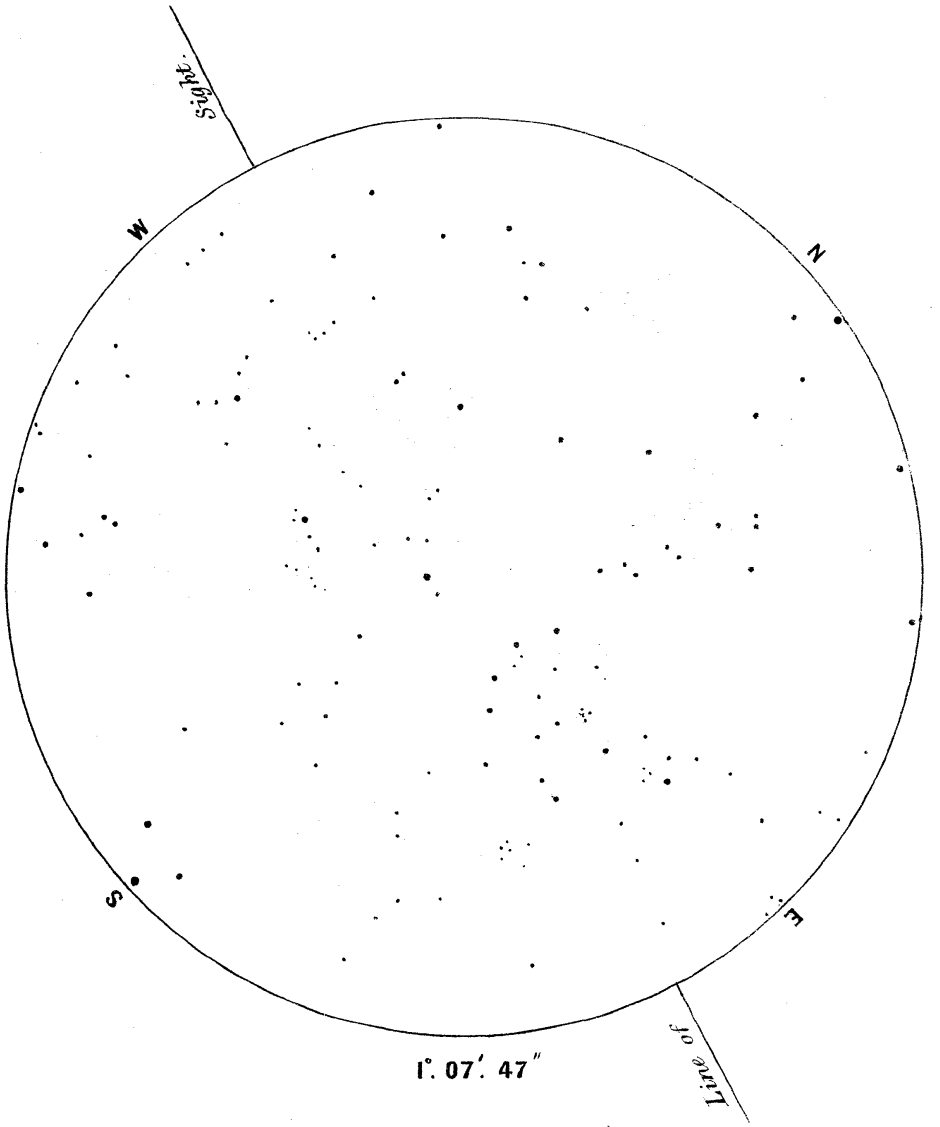

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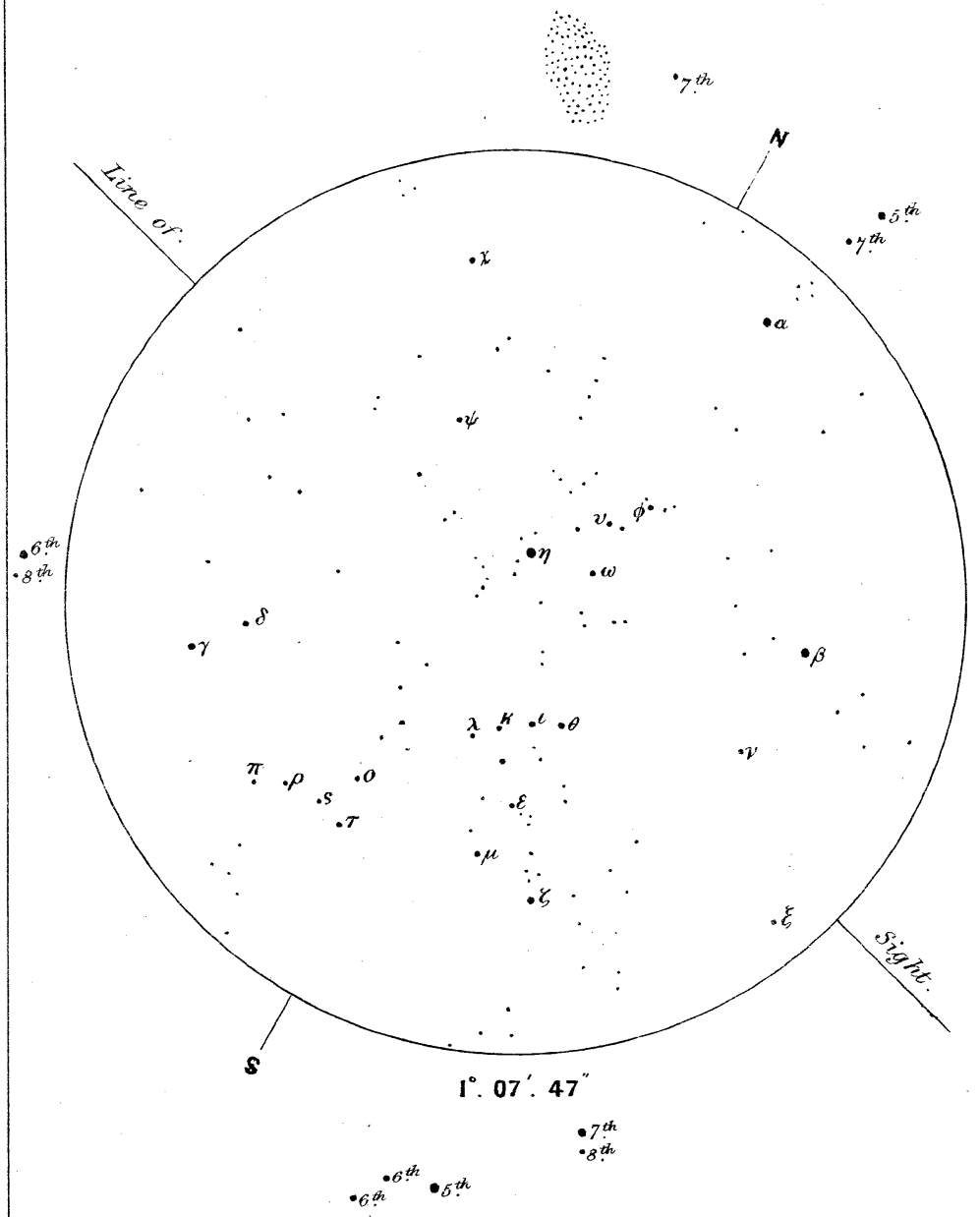

W. Metcalfe & Sons. Litho: Cambridge.

gram accompanying it. Comparing the latter with Mr. Abbott's former representations of the Nebula, viz., that for 1863, in vol. xxiv. p. 5 (*Monthly Notices*), and that for 1868, in vol. xxviii. p. 200, the amount of variation is so astonishing that, considering all three to have been figured by the same observer, using (at least for the two last) the same telescope (a 5-feet Equatoreal, aperture not stated), it would seem to be doing injustice to Mr. Abbott not to place this last drawing also on record in the same manner as the others.

At the same time there is this difficulty. On comparing the present diagram with that in vol. xxviii. p. 200, it will be seen that, as regards most of the principal *stars* laid down, and several of the smaller groups, they exhibit on the whole a sufficient general agreement, considered as eye-drafts, while both are utterly irreconcilable both with my son's configurations (*Monthly Notices*, vol. xxix. p. 85), and with my own recorded observations, with which the latter entirely agree. On carefully examining the *present* diagram, I find it open to the very same remarks which I had occasion to make in my former communication on the same subject, viz., that there is not one among all the stars delineated which I can identify with any of those laid down in my own drawings and catalogued positions. The orientation (which I had surmised might possibly have been mistaken by Mr. Abbott in copying, or by myself), being here placed, by its reiteration, beyond a doubt; the most superficial inspection suffices to show that there is no correspondence whatever between us; and that his field of view of 1° 8′ diameter differs as completely from a similar field, in my monograph having *η Argûs* near the centre, as if the telescope had been directed to quite a different part of the heavens. For example, Mr. Abbott places within a distance of 11½′ (on the scale of his drawing) from η, five stars of magnitudes at least equal to η, that is, 7 mag. (if I am right in supposing the large star a little south-preceding the centre of his figure to be intended for η, and according to his former figure it can be no other), while in my monograph only one star of that magnitude (marked O) occurs within that distance; and five of the 8th magnitude, F, D, D′, C, K′, which however stand quite differently in relation to η from any of the larger ones in Mr. Abbott's diagram.

This would, however, be of little moment, were it permitted to suppose that attention had been given only to the delineation of the Nebula, and that the stars had been put down at random or with little regard to their real configurations. Mr. Abbott, however, in the paper which accompanies his diagram, distinctly repudiates this supposition, and insists on the correctness of his representations of the stars in the field of view delineated; not, indeed, as micrometrically accurate, but as careful eye-drafts. "All the drawings," he says, in reference to this especial point, "the present as well as the former ones, were carefully copied from the object."

Under these circumstances, were Mr. Abbott resident in England, I should feel disposed to recommend referring the communication back to him (*accompanied with these remarks*) for such elucidation of the causes of the discrepancy in question as the case may admit, and with a request that he would furnish *some* instrumental determination (however rough) of the differences of R.A. and P.D. between η and the eight (or nine?) other stars of equal magnitude with η, which he states to be included in his diagram, as also the *apertures* of the telescopes used; and, deferring the final decision of the Council as to the publication *in extenso* of the communication, to notice in the forthcoming Number of the *Monthly Notices* of proceedings, the fact of its having been read, with mention of his having observed on January 28, 1870, the Nebula to consist of five nebulous arcs or masses convex towards each other and towards η, which occupied a position at or near the point of embranchment of the same number of non-nebulous roads or channels running outwards in five different directions.

The Council, however, will best judge whether such a course is advisable, taking into consideration the length of time which must elapse before a reply could be received from Hobart Town.

Collingwood, May 19, 1870.

The substance of these remarks was communicated to Mr. Abbott in a letter dated 13th June, 1870, and he replied thereto in the following communication:—

In reply to the queries set forth in the letter of the 13th June last, I may state that it is not my intention or desire to dispute either Sir John's or Lieut. Herschel's configurations of the star η *Argûs* and its Nebula, but to draw the attention of the astronomical world to the altered features of both, with a view of ascertaining a solution of the changes seen in this most remarkable object.

My own opinion is, that no two widely different instruments will show the gradations of nebulous objects exactly alike; it will require a standard instrument. In my own case I have used the 5 feet with a 4-inch clear aperture, a comet eye-piece of 28, both perfect, for twelve years. And as a check, in the open air, I use a 3½-inch Cook and Sons, with a Kellner's orthoscopic eye-piece of 50.

Most of the questions put to me have been explained in former papers, excepting as regards measurement. In this I am not at all inclined to dispute either Sir John's or Lieut. Herschel's statements; what I contend for is the diminution in the size of the star η, and a continued, rapid breaking up and displacement of the Nebula surrounding it; both sufficiently apparent to any one acquainted with the object, and to be seen on fine nights with the naked eye.

The last question you require to be answered is, "Can I give any elucidation as to the difference?" &c. This borders on a physical question, and on that point I regret to have caused some displeasure to Sir John Herschel, by quoting a passage in the fifth edition of his *Outlines*, p. 639, sec. 871.

The object is now getting below the Pole, and daylight fast increasing; but when a favourable opportunity occurs, I will not omit to pay every possible attention to the requirements contained in your letter, feeling convinced, notwithstanding the contrary opinion, that the fluctuations which have taken place in *Argus* will some day become better known.

With regard to the fluctuations, distance and position very materially affect visible motion, and the changes about η are physical, if any, and therefore it would be necessary to adopt a real standard instrument, such as the old 18-inch erected at the Cape of Good Hope in its former position.

P.S.—I cannot refrain from mentioning my surprise at seeing an extract from a letter to the Astronomer Royal from Mr. H. A. Severn, of Melbourne, in the *Monthly Notices*, vol. xxx. p. 180. It is utterly at variance with the author's letters addressed to me, in all of which he not only acknowledges the changes in *Argus*, but also appears anxious that I should be credited with the discovery.

Surely there must be some mistake in the extract from the *Notices*. I have this moment received another letter from Mr. Severn, in which he expresses the same opinion on the fluctuations as before.

Private Observatory, Hobart Town,
Tasmania, 7th September, 1870.

There has since been received from him the following further communication:—

On η Argûs and its Surrounding Nebula. By F. Abbott, Esq.

To the Honorary Secretaries and Referees appointed by the Council of the Royal Astronomical Society to make inquiry as to certain alterations which have taken place in the star η *Argûs* and its surrounding Nebula.

In carefully looking over the drawings referred to, which were taken at Bangalore by Lieut. Herschel, with the object η *Argûs* 15° above the horizon, and also the *reversed* copy of Sir J. Herschel's, and on consideration of the discussion given with the drawings, I do not think that Lieut. Herschel's observations tend to disprove any one of the alterations which I have previously communicated to the Society, but, on the contrary, rather to confirm them. This, I think, will appear clear by an inspection of